

First Zircon Fission Track Analysis in Western Anti-Atlas, Morocco: Evidence of Early Variscan Deformation of the Mauritanide Foreland Belt

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The Western Anti-Atlas fold belt corresponds to the basement-cored, eastern foreland fold belt of the Appalachian-Alleghanian-Variscan-Mauritanide belt. The age of deformation and uplift is still poorly constraint in Western Anti-Atlas (WAA), because of the lack of Carboniferous deposits in the belt itself. In this work, fission track (FT) analysis was performed on zircon grains extracted from the Proterozoic granites (either Eburnian or Pan-African in age) cropping out in the Kerdous and Ifni inliers. We obtained 9 apparent ages spanning from 391 ± 41 Ma to 324 ± 37 Ma, with 8 dates on 9 fairly grouped between 352 ± 26 and 324 ± 37 Ma, whatever the age of the granite emplacement may be. This implies (if we do not consider the isolated date) that the WAA basement has been heated above 280°C (partial annealing T for zircon) before and/or during the Tournaisian (359 ± 2 - 345 ± 2 Ma), and was subsequently cooled below 180°C before the Namurian (326 ± 1 - 312 ± 1). We propose an interpretation of the T-t evolution of the studied rocks, taking into account the subsidence curves published by Burkhard et al. (2006) for the WAA during the Cambrian- Carboniferous interval. These curves allow us to assume that burial metamorphism alone could explain annealing of the Proterozoic zircon grains as early as the Late Devonian. Obviously, this does not preclude the role of a compressional event which could have triggered the circulation of hot, overpressurised fluids in the tectonic prism of the WAA foreland belt. Erosion of the WAA mountain range is testified by the dominantly northwestern sources for the detrital input in the upper Namurian Reouina Sandstones of the Tindouf Basin (Cavaroc et al., 1976). This constrains the slope of the WAA Tt curve around 320 Ma to dip toward low T. Additional constrains are given by previous Rb-Sr and K-Ar datings on recrystallized micas from the Lower Paleozoic formations close to the Kerdous (370-290 Ma; Bonhomme & Hassenforder, 1985), and by K-Ar dates from the Kerdous inlier (360-310 Ma; Margoum, 2001, in Soulaïmani & Pique, 2004). We conclude that uplift and cooling of WAA occurred throughout the Early Carboniferous, from ca. 350 Ma to 320 Ma, within a dominantly compressional regime. This is consistent with the timing of the eclogite-facies metamorphism (ca. 330 Ma; Le Goff et al., 2001) and nappe emplacement in the Mauritanide belt (ca. 310 Ma; Lecorche et al., 1991). Additional isotopic and zircon FT dates are required to better constrain the WAA thermal evolution during the Variscan orogeny.

References:

- Bonhomme M., Hassenforder B., Le metamorphisme hercynien dans les formations tardi et post-panafricain de l'Anti-Atlas occidental (Maroc). *Donnees isotopiques Rb/Sr et K/Ar des fractions fines*. Sci. geol. Bull. Strasbourg 38 (1985) 175-183.
- Burkhard M., Caritg S., Helg U., Robert Ch., Charrue Ch., Soulaïmani A., Tectonics of the Anti-Atlas of Morocco, in D. Frizon de Lamotte, O. Saddiqi, A. Michard (Eds.), *Recent Developments on the Maghreb Geodynamics*. C. R. Geoscience 338 (2006) 11-24.
- Cavaroc V.V., Padgett G., Stephens D.G., Kanes W.H., Bouda A.A., Wollen I.D., Late Paleozoic of the Tindouf basin, J. Sedim. Petr. 46 (1976) 77-88.
- Lecorche J.P., Bronner G., Dallmeyer R.D., Rocci G., Roussel J., The Mauritanide Orogen and its northern extensions (Western Sahara and Zemmour), West Africa, in R.D. Dallmeyer & J.P. Lecorche (eds.), *The West African Orogen and Circum-Atlantic correlatives*, Springer Verl., 1991, 187-227.
- Le Goff E., Guerrot C., Maurin G., Iohan V., Tegye M., Ben Zarga M., Decouvertes d'eclogites hercyniennes dans la chaone septentrionales des Mauritanides (Afrique de l'Ouest), C. R. Acad. Sci. Paris 333 (2001) 711-718.
- Soulaïmani A., Pique A., The Tasrirt structure (Kerdous inlier, Western Anti-Atlas, Morocco): a late Pan-African transtensive dome J. Afr. Earth Sci., 39 (2004) 247-255.